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PRESSURE CORE SAMPLING OF GREASE WOOL

FOR

CLEAN FIBER DETERMINATION

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PRESSURE CORE SAMPLING OF GREASE WOOL FOR CLEAN FIBER DETERMINATION

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INTRODUCTION

Core sampling of grease wool for the determination of the clean fiber content has been employed by the U. S. Department of Agriculture for a number of years. The method, after considerable study, was adopted by the Department in 1946 for use in connection with the Government's wool price support program of that year. The method was found more satisfactory than the visual method of estimating yield and has continued in use since that time. There were, however, some technical difficulties. The method first employed a 3-inch diameter tube that was electrically driven. This required a powerful, heavy electric drill, the coring process was difficult physically, and the samples produced were quite large, in some cases amounting to as much as 150 pounds or more per lot. These samples in turn were expensive to ship to the testing laboratory. Furthermore, these large amounts of wool presented certain difficulties in blending and subsampling at the testing laboratory.

In an effort to find solutions to these problems smaller coring tubes were developed. A $1\frac{1}{4}$-inch coring tube was adopted by the Department in 1948. In 1950 experiments were inaugurated with coring tubes of $\frac{1}{2}$-inch and 3/8-inch diameter. It was found that core samples could be taken by pressure manually without the aid of an electric motor or rotary action, provided that a properly designed tube with a razor-sharp cutting edge was used. The size of the tube likewise was found to be a factor in pressure coring, the difficulties mounting with increasing tube size. Much of the experimental work was therefore done with the 3/8-inch tube. The terms, "pressure coring" and "pressure coring tubes" were applied to the method and sampling tools to distinguish them from the process and equipment requiring the use of an electric motor and rotary motion of the tube.

MATERIALS, METHODS, AND PROCEDURES

A number of lots of Territory, Fleece, and Oregon wools produced in 1951, 1952, and 1953 were used in the studies. The Territory and Oregon wools had been compressed in bales, and the fleece wools had been packed in the customary burlap bags.

All pressure cores were taken by a quick thrusting motion or pushing action of the tube into the bales or bags the full length of the coring tube, some 30 inches (Figs. 1, 2, and 3). A predetermined coring pattern defined the location of cores to be drawn from a bag or bale. The cores were extruded

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from the tube into moisture-proof containers to guard against possible changes in moisture content and shipped to the Livestock Division Wool Laboratory for determination of clean fiber content.

The various lots, after being weighed and core-sampled, were scoured, carded, and combed at commercial combing mills on the Eastern seaboard. The processed products were carefully weighed and sampled by hand, the samples analyzed, and the yields of the products calculated to a standard content of impurities. Two commercially determined yields were calculated for each lot--the mill scoured yield because that is commonly used as the measure of the value of a lot of wool, and the mill top-noil-waste yield, because it is generally felt this presents a more stable measure for comparative purposes of the final clean fiber products of a lot of wool.

RESULTS AND DISCUSSION

From a practical operational standpoint the pressure coring tubes were quite successful. Pressing the tube into the bag or bale being sampled was a matter of a few seconds, much quicker than rotary sampling with a drill. The cores produced were clean-cut, 3/8-inch in diameter and 20 to 30 inches long, exhibiting clearly the various types of wool and impurities through which the coring tube had passed (Figure 4). The problem of maintaining a sharp cutting edge was practically non-existent as compared with that encountered in connection with rotary tube coring. It was found that when the pressure tube tips were sharpened at the beginning of a day's sampling, they could be used for a full day, sometimes for as many as 300 to 400 cores, without resharpening. The sharpening technique, of course, had to be capable of producing a razor-sharp edge, and the steel of the tip had to be capable of receiving and holding such an edge.

The pressure core method has several advantages. The apparatus is light and portable, weighing approximately 4 pounds. It does not require the use of electricity. The weight of 100 individual cores will customarily range from 200 grams to 900 grams. Samples of this size are easy to pack and inexpensive to ship. When received in the laboratory they can be scoured and analyzed in their entirety, thus avoiding any possible subsampling error.

The 3/8-inch pressure core clean fiber content, the mill scoured and mill top-noil-waste yields are presented in Table 1. The 3/8-inch core results represent the mill scoured results quite well, but tend to be somewhat higher than the mill top-noil-waste yields. Technical difficulties in controlling commercial mill tests for comparative purposes may lead to results that do not show logical relationships. Under the conditions of this experiment, and as shown in Table 1, the core sample results have as much reliability as the mill tests on these entire lots. Two points make these satisfactory core sample results especially worthy of note. The first is that, due to the small size of many of the lots, the number of cores in the samples that were drawn had to be restricted to such an extent that limits of accuracy of plus or minus 1 percent could not be expected. The second point is that the core

Figure 1.--Pressure coring apparatus; handle, tube, and tip.

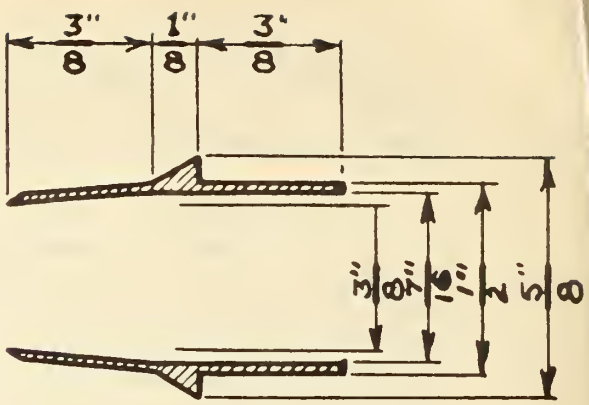

Figure 2.--Cross-section diagram of pressure coring tube tip, twice actual size.

Figure 3.--Pushing a pressure coring tube into a bag of domestic wool.

Figure 4.--Pressure cores drawn from a baled domestic wool.

samples rendered satisfactory results even on the bagged fleece wools. These wools are sometimes considered difficult to sample, particularly if they are loosely packed and should they contain large amounts of tags and other gross impurities. Thus the pressure coring technique appears to give results having definite value in sampling domestic grease wool in commercial packages. Final perfection and proof of the accuracy of the technique will be given only by an extended program of core-sampling and mill testing under very rigid control.

SUMMARY

1. Pressure core-sampling has been shown to be a practicable physical process, possessing several advantages over rotary core-sampling.

2. Pressure core samples are small, light, economical to ship, and easy to process in the laboratory.

3. Clean fiber determinations from the 3/8-inch pressure core technique for domestic wool appear to give acceptable accuracy.

Table 1.--Clean fiber content of grease wool as determined by laboratory testing of pressure core samples and mill processing of entire lots

Year	Grade	Weight of lot Pounds	No. packages in lot	No. packages cored	No. cores drawn	Clean fiber content in percentage: Mill Scoured T-N-W	Mill Scoured T-N-W	3/8" Cores
Territory wool in bales								
1951	64s Staple	10,606	26	10	100	49.0	45.6	48.0
1951	64s French	8,325	19	10	80	42.2	41.0	43.3
1951	60s Staple	3,651	9	9	72	50.5	47.9	48.2
1951	56/58s Staple	5,689	14	10	80	53.3	50.8	50.8
1951	50s Staple	3,562	9	9	72	57.1	51.7	54.9
1951	46/48s Staple	831	2	2	16	53.2	56.7	54.9
1951	60s and Finer seedy and stained	1,593	3	3	24	43.9	42.7	39.7
1951	58s and Coarser seedy and stained	833	2	2	32	49.0	47.3	45.3
1951	60s and Finer crutchings	655	1	1	16	37.4	38.4	38.1
1951	58s and Coarser crutchings	650	1	1	16	36.0	36.9	35.3
Average						47.2	45.9	45.9
Fleece wool in bags								
1952	3/8 Staple	1,070	5	5	50	47.5	47.8	49.3
1952	3/8 French	935	5	5	50	52.5	48.8	52.8
1952	3/8 Staple	978	5	5	50	54.6	51.3	54.4
1952	¼ Bright stained	998	5	5	50	60.0	58.6	58.9
1952	Low ¼ stained	1,045	5	5	50	60.0	59.1	58.9
1953	3/8 Baby combing	1,004	5	5	50	47.5	47.5	49.9
1953	Bright 3/8 staple	946	5	5	50	50.8	50.0	51.1
1953	Bright ¼ stained	1,017	5	5	50	55.6	53.9	53.6
1953	Low ¼ staple	1,190	5	5	50	55.2	51.9	54.6
Average						53.7	52.1	53.7
Oregon and Washington wool in bales								
1952	Fine Staple	4,918	11	10	110	44.5	42.9	43.9
1953	E. Oregon Fine staple	1,024	2	2	20	43.9	43.1	41.6
1953	W. Oregon ¼-Blood	1,003	3	3	30	53.6	53.5	54.9
1953	W. Oregon Low ¼-Blood	1,129	3	3	30	64.2	62.4	62.7
1953	E. Washington Low ¼-Blood	1,410	3	3	30	47.2	45.1	46.4
Average						50.7	49.4	49.9
Average of all lots						50.4	49.0	49.6